

Safety Data Acquisition and Analysis Guide



Public Transportation Division

September 2003

Safety Data Acquisition and Analysis Guide

Contents:

Section 1 — Overview.....	1
Section 2 — Safety Data Acquisition and Analysis Plan.....	2
Introduction.....	2
Goals and Objectives.....	2
Section 3 — Safety Data Acquisition.....	4
Introduction.....	4
Regulations and Reporting Requirements.....	4
Resources for Collecting Information.....	4
Database.....	6
Section 4 — Safety Data Analysis.....	8
Introduction.....	8
Vehicle Incident Investigation.....	8
Non-preventable/Preventable Vehicle Incidents.....	9
Incident Review Board.....	12
Section 5 — Risk Management Program.....	14
Introduction.....	14
System Definition.....	15
Hazard Identification.....	16
Hazard Analysis.....	17
Risk Assessment.....	17
Hazard Resolution.....	18
Risk Management Example.....	19
Follow-up.....	20
Section 6 — References and Resources.....	21
Section 7 — Appendix.....	23
Appendix A – Employee’s Account.....	24
Appendix B – DART Accident Report Form.....	25
Appendix C – TxDOT Reporting Form for Security Incidents.....	27
Appendix D – TxDOT Reporting Form for Transit Vehicle Incidents.....	29
Appendix E – Courtesy Card.....	32
Appendix F – Collision Scene Checklist.....	33
Appendix G – Supervisor Accident/Incident Report.....	34
Appendix H – Accident Sketches.....	36
Appendix I – Character Template.....	37
Appendix J – Supervisor’s Investigation Report.....	38
Appendix K – Supervisor’s Incident Report.....	39
Appendix L – Bus Safety Inspection Checklist.....	41
Appendix M – Generic Hazard Checklist.....	43
Appendix N – Accident Register.....	46
Appendix O – Accidents by Time of Day.....	47
Appendix P – Passenger Accidents.....	48

Section 1

Overview

The collection, analysis, and distribution of safety data are important building blocks in a risk management program. Risk management is the process of controlling the probability and severity of losses to a transit agency's assets and income. Foundational elements to a risk management program include [hazard identification](#), [hazard analysis](#), [risk assessment](#), and [hazard resolution](#).

Accumulating safety data helps in the hazard identification phase. It includes information collected from safety audits and incidents such as passenger injuries or claims, employee injuries, accident reports, vehicle incidents, and security incidents. Analyzing this safety data is an important step towards resolving potential hazards and allocating resources to safety elements that may reduce the number of incidents.

The goal of this *Safety Data Acquisition and Analysis Guide* is to assist the transit agency in developing a plan for the collection, organization, and analysis of safety information. It is not intended to be prescriptive or mandatory.

For the purposes of this guide, an incident is defined as any intentional or unintentional act that occurs on or in association with transit-controlled property and that threatens or affects the safety or security of an individual or property. This definition applies whether or not the incident results in an accident, injury, fatality, security breach, or property damage.

The Public Transportation Coordinator in the Texas Department of Transportation (TxDOT) [district office](#) has an electronic version of this document if a transit agency wants to copy any material into their management plans.

Section 2

Safety Data Acquisition and Analysis Plan

Introduction

The identification of potential safety hazards is the responsibility of all transit agency employees. However, it must be determined in advance how the data will be used and who will be responsible for its evaluation.

Analysis of safety data and incident reports may provide insight into what has happened in the past as well as:

- ◆ determine safety trends and patterns in transit agency operations
- ◆ guide policy development
- ◆ provide insights on current vulnerabilities
- ◆ assist in establishing priorities and allocations of resources
- ◆ evaluate the success of safety programs and technologies
- ◆ focus personnel deployment.

The collection, maintenance, and distribution of this safety data may require great efforts due to management concerns, the involvement of multiple departments, and issues concerning the compiling of the data.

It is also important that transit agencies communicate, coordinate, and compare safety data. This collaboration can identify potential hazards before they occur by monitoring safety events at other transit agencies, especially those with similar components.

Goals and Objectives

Management plans usually begin with a basic set of goals and objectives. Several foundational goals for a safety data acquisition and analysis plan may include, but are not limited to:

- ◆ reduce costs associated with the occurrence of incidents and hazards
- ◆ mitigate the effects of workplace hazards on personnel and property
- ◆ generate a standardized methodology for incident data collection
- ◆ develop a [database](#) for compiling a core set of incident characteristics
- ◆ report safety data that is practical and useful for the transit agency
- ◆ monitor and analyze accrued incident information
- ◆ compare safety statistics between similar transit agencies
- ◆ determine causal factors or trends for the purpose of reducing transit vehicle incidents
- ◆ identify and implement corrective actions

- ◆ collate incident data with prior safety data for the evaluation of corrective actions
- ◆ assess the effectiveness of specific training programs and safety related capital improvements.

Section 3

Safety Data Acquisition

Introduction

All necessary information pertaining to a specific incident should be contained in standard format and stored in a specified location. Potential uses for this documentation include:

- ◆ ongoing training, especially where human error and procedural error are involved
- ◆ litigation, where documentation of efforts to prevent such incidents can be valuable in establishing that transit management is reasonable and prudent
- ◆ expedite the preparation of required reports to all necessary agencies, such as the [National Transportation Safety Board](#), state and local regulatory agencies and governing boards
- ◆ budget allocations, where certain redesigns and equipment purchases can be easily justified.

Regulations and Reporting Requirements

Transit employees should be required to submit a written report to management of their involvement in and/or witnessing of any incident. Examples of different reporting forms can be found in [appendix A](#) and [appendix B](#). The report should be filled out on the day the incident occurs to ensure accuracy and completeness when describing the events leading up to the incident. The report should capture what the employee saw, what actions were taken and when these actions were taken. Employees who are unsure as to whether an incident report is necessary should seek clarification from management.

The Texas Administrative Code (TAC) [Title 43, rule 31.48](#), requires that transit agencies annually report the total number of incidents per 100,000 miles of service and the average number of miles between revenue vehicle mechanical system failures which prevent a vehicle from completing a scheduled revenue trip.

The TAC also requires all incidents that meet the criteria established by the Texas Department of Transportation (TxDOT) to be reported within five days of the incident or discovery of the incident. The TxDOT procedures and reporting forms are included in [appendix C](#) and [appendix D](#) or can be downloaded off the Internet site under [Public Transportation Division](#).

The [Texas Workers' Compensation Commission](#) sets the safety standards for the workplace. Regulations and guidance on these standards can be found on their Internet site.

Resources for Collecting Information

Vehicle Incidents. The information gathered at the incident scene will come from two primary sources; the courtesy cards given to witnesses and passengers (see example in [appendix E](#)), and the information from the operator.

The operator's primary responsibility is the safety of his passengers and himself; however, the operator should record his version of the sequence of events as quickly as possible. The operator can identify any contributing factors that could be used as evidence to determine liability. Contributing factors could be people (the action of others), the environment (weather, traffic, time and light), equipment (defective or unfamiliarity), or avoidable distractions.

Usually a road supervisor will be called upon to collect information from the scene of an incident. It is advisable to have a documentation packet on each vehicle responding to an incident scene. Some suggested items in this documentation packet may include:

- ◆ camera or disposable camera
- ◆ extra rolls of film
- ◆ safety reflective vest
- ◆ measuring wheel
- ◆ yellow lumber crayon
- ◆ 100 foot tape
- ◆ 12" ruler
- ◆ clipboard
- ◆ flashlight
- ◆ spare batteries for flashlight and camera
- ◆ safety triangles or flares
- ◆ courtesy cards
- ◆ insurance forms
- ◆ checklist of actions to be taken before leaving the scene of the incident (see example in [appendix F](#))
- ◆ operators incident report form (sample forms are in [appendix B](#) and [appendix D](#))
- ◆ supervisor's accident/incident report (see example in [appendix G](#))
- ◆ pens or pencils
- ◆ sketch pad or graph paper (see sample sketches in [appendix H](#))
- ◆ sketch template (see example in [appendix I](#))

Courtesy cards are important because they provide a reserve of witnesses if an incident results in a lawsuit or if someone accuses the transit agency of mishandling an incident. Courtesy cards should be given to all passengers on the transit vehicle and any observers outside of the vehicle. Good witnesses can provide a clearer perspective of an incident by recounting their view of the sequence of events leading up to the incident.

A good sketch or diagram will clearly show the location of vehicles, road signs, intersections, the number of lanes, speed limits, etc. It could also show measured skid marks, road widths, distance from intersections, and other landmarks.

Workplace Incidents. Every task within a transit agency must be designed for safety. A high rate of workplace incidents may be the result of poor functioning in prevention systems. The prevention of and preparedness for workplace incidents needs to be woven into every system at the transit agency. When incidents do occur, the root cause of the incident must be determined and communicated so that others in the system are prepared.

Sources for gathering this information to analyze may include:

- ◆ historical data on disaster and major emergencies, prior complaints, investigations and incident reports
- ◆ employee reporting forms for security incidents, exposure incidents, and incident reports (see example of employee's account in [appendix A](#))
- ◆ judgment by knowledgeable individuals:
 - local experts
 - management (see examples of supervisor's investigation report in [appendix J](#) and supervisor's incident report in [appendix K](#))
 - [Occupational Safety and Health Administration \(OSHA\)](#)
 - federal and state health agencies
 - Workers' Compensation (copies of reporting forms and instructions may be obtained at <http://www.twcc.state.tx.us/index.html>)
- ◆ material safety data sheets (MSDS) prepared by the product's manufacturer with basic information on a chemical's physical properties, related health effects, fires, spills, handling and storage.
- ◆ design codes and standards, as well as, transit agency specifications
- ◆ safety audits of transit vehicle operators and mechanics (see example in [appendix L](#))
- ◆ safety audits of facilities with a generic or a specific hazards checklist (see example in [appendix M](#))

Database

If collected incident information is not readily available and easily organized by type and occurrence, it will be impossible to use the results to improve system safety. A computerized incident database is an essential safety management tool for most transit agencies. However, some transit agencies may be able to maintain data files in a manual format due to the smaller number of incidents. An example of an accident register is in [appendix N](#).

The development of an incident database depends on the specific requirements of each transit agency and the nature of the other information systems maintained by other departments (e.g., human resources may be collecting information on operator data or

training and risk management may be collecting information on claims). Therefore, a good informational exchange must be maintained among all systems within the transit agency. An examination of the database structure and trend analysis systems of other transit agencies may also be useful.

Queries on a database system can produce summary reports of incidents occurring by location, time of day, day of week, road conditions, collision dynamics, operator, weather conditions, etc. Several examples of one transit agency's queries can be seen in [appendix O](#) and [appendix P](#).

Another example of a transit agency's query on collisions and passenger incidents may appear as:

Collisions and Passenger Incidents		
Collisions	Number	Percent of Total
At intersections	9	25.7
Between intersections	11	31.4
Rear-end collisions in traffic	1	2.9
In loading zone	8	22.9
With objects	6	17.1
With pedestrians	0	-
Miscellaneous	0	-
<i>Total</i>	35	100.0
Passenger Incidents	Number	Percent of Total
Boarding	34	20.9
Alighting	47	28.8
On board	51	31.3
Wheelchair	5	3.0
Miscellaneous	26	16.0
<i>Total</i>	163	100.0

By arranging the data in the database a transit agency can track very specific problems and apply specific resolutions:

- ◆ which types of vehicles are more likely to be involved in side collisions, possibly leading to a decision to retrofit special lights or mirrors
- ◆ what intersections have the most incidents, possibly leading to the removal of obstructions to the operator's view or a redesign of the incident location
- ◆ how many wheelchair incidents, possibly leading to a change in securement devices or retraining of the operators
- ◆ how many passenger slips occur on board, possibly leading to a change in mid-aisle mats or retraining of the cleaning staff and operators
- ◆ which vehicles have the most equipment problems, possibly leading to warranty claims or a change in the vehicle specifications
- ◆ which task has the highest employee injury claims, possibly leading to a redesign of the task or the shop layout

Section 4

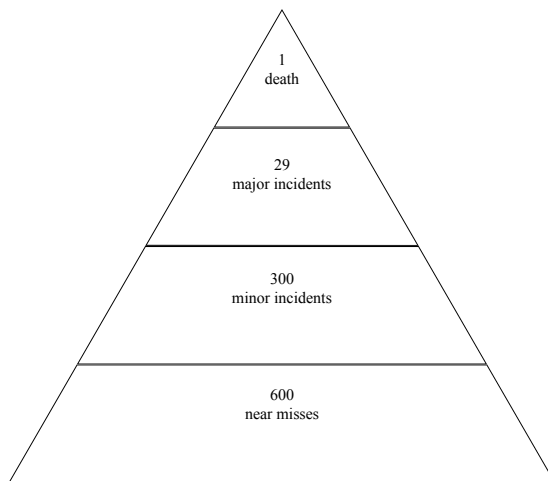
Safety Data Analysis

Introduction

A key objective of any transit agency is to provide a safe and reliable transportation system. Despite the existence of safety manuals and the provision of safety training, incidents still occur. Research on transit incidents has demonstrated that, for almost every type of incident, there is a recognizable pattern or chain of events leading up to its occurrence. Failure to review incident history and learn from it may result in a reoccurrence of those types of incidents.

However, a review of past incident data does not provide a complete analysis because the hazards identified will be limited to those that actually caused an incident. Transit agencies should also review their data on “near-misses” and other incidents that did not result in accidents, but easily could have. For example, a transit vehicle operator with a drinking problem will probably have several “near-misses,” minor collisions or other infractions that may suggest the nature of the problem. If the driving records are reviewed, the operator may be identified before a major incident occurs. Likewise, mechanical difficulties, such as failure of a brake light or turn signal, can be discovered during an investigation of a “near-miss” before they cause an incident.

As a result of numerous studies, the safety community has adopted the following Heinrich ratio for the predictability of fatal incidents. If a transit agency can recognize and respond to these difficulties quickly and efficiently, they can prevent fatal incidents.



Vehicle Incident Investigation

Investigating vehicle incidents is necessary for the collection and analysis of incident information. Investigations should be conducted as soon as possible after the incident;

otherwise, temporary physical evidence such as tire marks and pavement scuffs will disappear. Also, with the passage of time, people will forget or magnify details of the events.

An investigation of each vehicle incident can yield the following information:

- ◆ operator's performance skill
- ◆ contributing factors to the incident
- ◆ operator's judgment in taking action

The key decision in terms of avoiding future accidents is preventability. In order for a vehicle incident to be listed as preventable or non-preventable, complete details are needed of what the operator saw, when it was seen and whether action taken was appropriate to the circumstances. If the operator did not see or recognize a hazard in a timely manner, information should be developed as to why the hazard was not recognized in time or as to why the appropriate action was not taken in time to prevent the incident.

No two incidents are exactly alike, therefore, each incident must be judged individually. Some types of incidents can be prevented by employees, while others require changes in operating practices, policies or equipment.

Non-preventable/Preventable Vehicle Incidents

The act of classifying vehicle incidents as preventable or non-preventable is complex because standards for safe driving performance will differ by transit agency, insurance carriers, and law enforcement.

For the purposes of reviewing operator performance and identifying unacceptable safety hazards, a transit agency should establish internal standards for safe driving regardless of legal liability. Transit management must then clearly communicate these standards to their operators, safety representatives, and members of the [incident review board](#).

Guidelines for setting standards on incident preventability may be obtained from the [National Safety Council](#) or the [Federal Motor Carrier Safety Administration](#). The types of vehicle incidents listed below do not cover every incident that may occur, but may provide general guidance to assist in determining preventability.

Non-preventable Vehicle Incidents. A non-preventable vehicle incident is one in which the transit vehicle operator could not have taken any defensive action to prevent the incident from occurring. When an operator commits no errors and reacts reasonably to the errors of others, the National Safety Council considers the incident to be non-preventable. The following incidents may be considered non-preventable if the transit agency adopts these standards:

- ◆ Struck in rear by other vehicle
 - Operator was proceeding in transit vehicle's proper lane of travel at a safe and lawful speed.
 - Operator was not making sudden or abrupt lane change.

- Operator did not make sudden or abrupt stop.
- Operator was stopped in traffic due to existing conditions or was stopped in compliance with traffic sign, signal, or the directions of a police officer or other person controlling traffic.
- Operator was in proper lane waiting to make turn.
- ◆ Struck while parked
 - Operator was properly parked in a location where parking was permitted.

Preventable Vehicle Incidents. Preventable vehicle incidents, in general, are defined as ones in which the transit vehicle operator failed to do everything reasonable or defensively to prevent the incident despite the action of others or the presence of adverse conditions. When an operator commits errors and/or fails to react reasonably to the errors of others, the National Safety Council considers an incident to be preventable.

The classification of preventable is not solely based on or determined by legal liability. In fact, the transit agency may classify the incident as operator preventable, even though the other motorist received a traffic citation. The following incidents may be considered preventable if the transit agency adopts these standards:

- ◆ Incidents at intersections
 - Operator failed to control speed so that transit vehicle could stop within available sight distance.
 - Operator failed to check cross-traffic and wait for it to clear before entering intersection.
 - Operator pulled out from side street in the face of oncoming traffic.
 - Operator collided with person, vehicle, or object while making right or left turn.
- ◆ Striking other vehicle in rear
 - Operator failed to maintain safe following distance and have transit vehicle under control.
 - Operator failed to keep track of traffic conditions and did not slow down.
 - Operator failed to ascertain whether vehicle ahead was moving slowly, stopped, or slowing down for any reason.
 - Operator misjudged rate of overtaking.
 - Operator came too close before pulling out to pass.
 - Operator failed to wait for vehicle ahead to move to the clear before starting up.
 - Operator failed to leave sufficient room for passing vehicle to get safely back in line.
- ◆ Sideswipe and head-on collisions
 - Operator was not entirely in transit vehicle's proper lane of travel.
 - Operator did not pull to right, slow down or stop for vehicle encroaching on transit vehicle's lane of travel (when such action could have been taken without additional danger).

- ◆ Struck in rear by other vehicle
 - Operator was passing slower traffic near an intersection and had to make sudden stop.
 - Operator made sudden stop to park, load, or unload.
 - Vehicle was improperly parked.
 - Operator rolled back into vehicle behind transit vehicle while starting on grade.
- ◆ Squeeze plays and shutouts
 - Operator failed to yield right-of-way when necessary to avoid incident.
- ◆ Backing incidents
 - Operator backed up when backing could have been avoided by better planning of route.
 - Operator backed up when such backing could have been avoided.
 - Operator failed to check proposed path of backward travel.
 - Operator depended solely on mirrors when it was practicable to ask assistance from a guide.
 - Operator failed to check behind vehicle parked at curb before attempting to leave parking space.
 - Operator backed from blind side when a sight-side approach could have been made.
- ◆ Incident involving rail operated vehicles
 - Operator attempted to cross tracks directly ahead of train or streetcar.
 - Operator ran into side of train or streetcar.
 - Operator stopped or parked on or too close to tracks.
- ◆ Incidents while passing
 - Operator passed where view of road ahead was obstructed by hill, curve, vegetation, traffic, adverse weather conditions, etc.
 - Operator attempted to pass in the face of closely approaching traffic.
 - Operator failed to signal change of lanes.
 - Operator pulled out in front of other traffic overtaking from rear.
 - Operator cut in too short while returning to right lane.
- ◆ Incidents while being passed
 - Operator failed to stay in transit vehicle's lane and hold speed or reduce it to permit safe passing.
- ◆ Incidents while entering traffic stream
 - Operator failed to signal when pulling out from curb.
 - Operator failed to check traffic before pulling out from curb.
 - Operator failed to look back to check traffic if mirrors did not show traffic conditions.

- Operator attempted to pull out in a manner that forced other vehicle(s) to change speed or direction.
- Operator failed to make full stop before entering from side street, alley, or driveway.
- Operator failed to make full stop before crossing sidewalk.
- Operator failed to yield right of way to approaching traffic.
- ◆ Pedestrian incidents
 - Operator did not reduce speed in area of heavy pedestrian traffic.
 - Operator was not prepared to stop.
 - Operator failed to yield right-of-way to pedestrian.
- ◆ Mechanical defects incidents
 - Defect was of a type that operator should have detected in making pre-trip inspection of vehicle.
 - Defect was of a type that operator should have detected during the normal operation of the vehicle.
 - Operator's abusive handling of the vehicle caused defect.
 - Defect was known to operator, but ignored.
 - Operator was instructed to operate with known defect.
- ◆ All types of incidents
 - Operator was not operating at a speed suitable for the existing conditions of road, weather, and traffic.
 - Operator failed to control speed so that transit vehicle could stop within assured clear distance.
 - Operator misjudged available clearance.
 - Operator failed to yield right-of-way to avoid incident.
 - Operator failed to accurately observe existing conditions.
 - Operator was in violation of transit agency operating procedures, federal or state regulations, or any applicable traffic laws or ordinances.

Incident Review Board

In order to establish consistent direction and review of safety and security related issues, a review board of transit employees should be established. This board may review compliance with transit agency policies, rules, regulations, standards, codes, and procedures and identify changes or new challenges as a result of incidents. The incident review board becomes a mechanism through which the transit agency:

- ◆ identifies safety and security hazards
- ◆ organizes incident investigations
- ◆ recommends and evaluates corrective actions to address findings from investigations

- ◆ develops strategies for resolving safety and security hazards
- ◆ coordinates the sharing of responsibilities and information
- ◆ manages the integration of safety and security initiatives and policies
- ◆ evaluates the effectiveness of safety and security initiatives
- ◆ coordinates interaction with external agencies and governing boards
- ◆ provides assistance during litigation

To ensure impartiality, board members should include all of the key departments; including management, operations, maintenance, training, and facilities. Diversity in the membership ensures that the transit agency's safety rules, operating rules, training programs, maintenance policy, and general traffic and route conditions are considered in each review. Each member should also have a full understanding of the federal drug and alcohol testing requirements, thorough knowledge of the transit agency's standards for preventability, and training in defensive driving.

The following points are suggested as a means for anonymity and impartiality in each incident review:

- ◆ the name of the employee involved in the incident should not be revealed to board members
- ◆ the employee involved should not be called before the board to discuss the incident, the incident report should represent the employee
- ◆ individual board member's decisions should not be divulged to the employee involved in the incident

Members of the incident review board should be rotated on a regular basis. However, only one new member should be taken on the board at a time. This allows the new member to absorb some of the experience of the senior members before another member is rotated.

Corrective actions and preventive measures recommended by the board could be discussed during open safety meetings, without mention of the name of the individual involved. The same material can also be used for in-house publications, bulletins, and employee news letters.

Section 5

Risk Management Program

Introduction

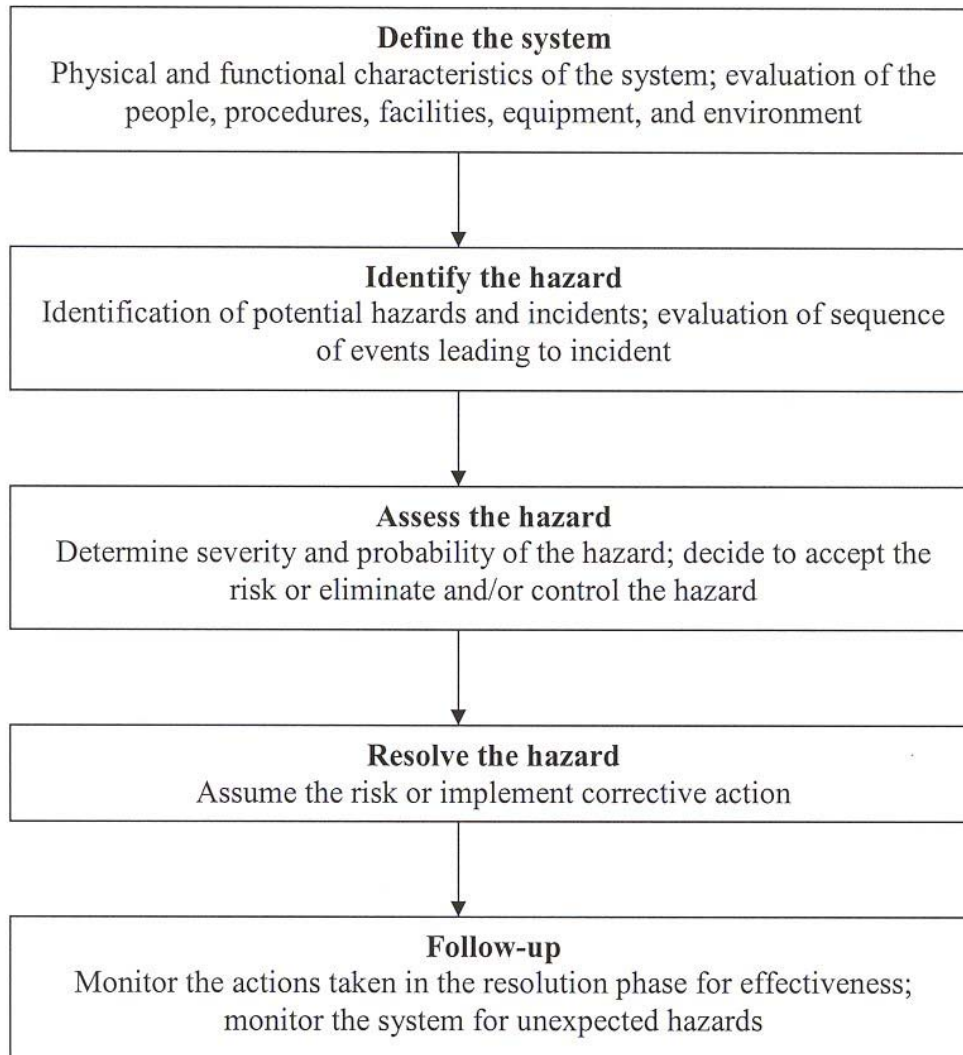
All transit agencies should be cognizant of their exposure to potential hazards and the liabilities resulting from them. Early detection and resolution of these safety hazards can avert many incidents and lessen their effects. Even those transit agencies with one vehicle can benefit from resolving hazards which may result in costly litigation and damages.

There are numerous losses that can result from incidents, some costs are difficult to determine but the following list may identify potential expenditures:

- ◆ payments for settlement of injury or death claims, including awards to dependents and for plaintiff legal fees
- ◆ payments for property damage claims which may not be covered by insurance:
 - replacement costs for vehicles, property, or other damaged items
 - loss of function and operations income
 - recovery and salvage of damage equipment
 - expenditures of emergency equipment and supplies
 - costs of emergency assistance
 - administrative costs
 - plaintiff's legal fees
 - lost time and wages
- ◆ legal fees for defense against claims
- ◆ punitive damages assessed
- ◆ costs of incident investigation
- ◆ corrective actions to prevent recurrences
- ◆ slowdowns in service while incident causes are determined and corrective actions are taken
- ◆ penalties for failure to take action to correct hazards
- ◆ lost time of transit personnel
- ◆ increased insurance costs
- ◆ loss of public confidence and ridership
- ◆ loss of prestige
- ◆ degradation of employee morale

There is no one risk management program or approach that is right for every transit agency. Due to the varying sizes and composition of fleet vehicles and employees, each transit agency needs to assess its own system and design a program specific to its particular needs.

The general process to a risk management program may visually be described as:



System Definition

All systems within a transit agency should be involved in the risk management process, including operations, safety, engineering, procurement, and maintenance. Each system should be defined by its physical and functional characteristics: equipment, procedures, people, and environment. Thorough knowledge and understanding of these individual elements and how they interface with each other is essential to identifying hazards.

Hazard Identification

The initial step in identifying potential hazards is to identify the incidents that may result if the hazards are not eliminated or controlled. A transit agency that has been [acquiring safety data](#) can organize and [analyze](#) the information by common elements looking for potential hazards.

Studying the sequence of events leading up to an incident can uncover the absence of, or weakness in, controls over the energy sources that cause incidents. It can reveal those areas that may expose the transit agency to more serious consequences. Examples of potential hazards warranting an analysis could include:

- ◆ security incidents
- ◆ biosafety
- ◆ confined spaces
- ◆ diesel and carbon monoxide emissions
- ◆ indoor air quality
- ◆ ergonomics in the vehicle and the workplace
- ◆ fatigue
- ◆ noise and vibration
- ◆ power tools and shop equipment
- ◆ temperature extremes
- ◆ welding, cutting, brazing
- ◆ workplace violence
- ◆ lockout/tagout
- ◆ powered industrial trucks
- ◆ fires
- ◆ vehicle incidents
- ◆ electrical hazards and power failures
- ◆ bomb threats
- ◆ acts of terrorism
- ◆ natural disasters (earthquake, flood, or tornado)
- ◆ hazardous material spills or intrusions
- ◆ slippery surfaces.

Reviewing the occurrence and handling of safety events at other transit agencies can also prevent many incidents before they occur. However, uniform reporting is an essential element in making statistical comparisons of incidents within the transit industry or with national or state trends.

Hazard Analysis

Hazard analysis should be conducted throughout the planning, design, construction, testing, operation, maintenance, and disposal phases of all transit projects. Hazard analysis can aid in implementing corrective actions based on how the transit agency could have handled each incident differently.

Transit management should rank each identified hazard according to its probability of occurrence. Ultimately, each transit agency should make their own determinations; however, some transit agencies may use a ranking system as depicted below:

Hazard Probability Categories

Description	Level	Specific Component or System	Fleet or Inventory
Frequent	A	Likely to occur frequently.	Continuously experienced
Probable	B	Will occur several times in the life of an item.	Will occur frequently
Occasional	C	Likely to occur sometime in the life of an item.	Will occur several times
Remote	D	Unlikely but possible to occur in the life of an item.	Unlikely but can reasonably be expected to occur
Improbable	E	So unlikely, it can be assumed occurrence may not be experienced.	Unlikely to occur, but possible

Risk Assessment

A comprehensive study of those facilities and systems most vulnerable to potential hazards is called a risk assessment. The risk is evaluated in terms of whether it will result in an incident and the benefits to be gained from accepting the risk. In its simplest terms, risk might be expressed as a product of the probability of an incident occurring from a potential hazard, the facility's or system's vulnerability to this hazard, and the potential damage costs:

$$\text{Risk} = \text{Probability} \times \text{Severity}$$

Starting with those facilities and systems with the highest probability and vulnerability, each hazard should be assessed based on the severity of damage to the transit agency:

- ◆ How are employees, facilities, passengers, and/or systems affected or damaged by this potential hazard?
- ◆ What is the best estimate of damage costs associated with this hazard?
- ◆ Approximately how often does this hazard occur?

Ultimately, each transit agency should make their own determinations; however, some transit agencies may use a classification system as depicted below:

Hazard Severity Categories

Category	Severity	Characteristics
I	Catastrophic	Death, severe environmental damage, or damage to areas with major financial impact or extended interruption of critical services

II	Critical	Severe injury, severe occupational illness, environmental damage, or damage to areas containing physical value, confidential information, or computer access to sensitive data/operational processing networks
III	Marginal	Minor injury, minor occupational illness, environmental damage, or damage to areas where disruption is moderately serious for the transit agency
IV	Negligible	Less than minor injury, occupational illness, environmental damage, or areas relatively unimportant to the transit agency operations

The following assessment table can then be created by combining the probability and severity rankings to categorize identified hazards:

Categories for Risk Assessment				
Probability/Severity	I (Catastrophic)	II (Critical)	III (Marginal)	IV (Negligible)
A (Frequent)	IA	IIA	IIIA	IVA
B (Probable)	IB	IIB	IIIB	IVB
C (Occasional)	IC	IIC	IIIC	IVC
D (Remote)	ID	IID	IIID	IVD
E (Improbable)	IE	IIE	IIIE	IVE

Legend	Hazard risk index	Acceptance criteria
	IA, IB, IC, IIA, IIB, IIIA	Unacceptable, management must take action
	ID, IIC, IID, IIIB, IIIC	Undesirable, management decision is required
	IE, IIE, IIID, IIIE, IVA, IVB	Acceptable with management review, requires monitoring
	IVC, IVD, IVE	Acceptable without management review

Hazard Resolution

By assessing those facilities and systems with a high probability rating and a high severity rating, crucial decisions can be made regarding the distribution of available resources. The costs and benefits of different options for managing risk must be considered with the transit agency's capacity to finance and administer these options. The transit agency may decide to control, transfer, remove, and/or accept the risk. Several examples for corrective actions may include, but are not limited to:

- ◆ Risk control
 - fire protective equipment for fire emergencies
 - protective shelters for employees during a tornado emergency
 - reassess work/shop layout for flood emergencies
 - fine tune background checks on operators
 - update training requirements
 - warning devices
 - preventive maintenance program
- ◆ Risk transfer
 - shift the burden of financial responsibility for potential losses to a third party, such as an insurer
 - evaluate “hold-harmless” clauses in contracts

- ◆ Risk removal
 - eliminate the use of the system, subsystem, or equipment that creates the hazard
- ◆ Risk acceptance
 - take financial responsibility for all or some portion of a potential loss
 - evaluate the deductible level set on vehicle collision insurance
 - evaluate insurance policies

Risk Management Example

The following example may help in understanding the risk management process. Risk assessment may focus on a number of potential hazards but this example will demonstrate the process for three hazards only; vandalism, robbery, and fire.

Hazard Identification. Transit management determines what hazards are most likely to occur and generates a list of potential hazards. The transit agency then assesses their facilities and systems based on this list of potential hazards.

For example, a review of past security incidents and input from local police indicates that acts of vandalism and robbery are possible. Fires are potential hazards that can start anywhere so they should be added to the list.

Hazard Analysis. While subjecting each facility and system to its vulnerability of vandalism, it is determined that the transit agency's control center might have a very low vulnerability to vandalism and be assigned a rating of E (improbable). In contrast, transit management may decide that robberies and vandalism are more likely in transit vehicles and facilities and assign higher ratings. The following is an example of how this transit agency may rank its vulnerability on these few selected hazards:

Vulnerability Analysis			
Facilities/Systems and Hazards	Vandalism	Robbery	Fire
Facilities			
• Dispatch Center	E	D	D
• Reception Room	C	C	D
Systems			
• Controls	E	E	D
• Electrical System	E	E	D
• Transit vehicles	B	C	C

Risk Assessment. Using the examples from this vulnerability analysis table, transit management assigns different severity ratings to these hazards. A higher severity rating may be given to a fire in the dispatch room because the movement of transit vehicles is greatly affected when dispatch equipment is damaged. This loss of equipment may also have consequences in passenger and driver safety, continuity in transportation service, loss in revenue, and security concerns. The following is an example of a risk assessment table created for these previously selected hazards:

Risk Assessment Table

Facilities/Systems and Hazards	Vandalism	Robbery	Fire
Facilities			
• Dispatch center	IE	ID	ID
• Reception room	IIIC	IIIC	IID
Systems			
• Controls	IE	IE	ID
• Power distribution	IE	IE	ID
• Transit vehicles	IVE	IC	IC

Hazard Resolution. Using the risk assessment table, transit management individually decides to control, transfer, remove, or accept each potential hazard. Since a fire in the dispatch room has the highest severity rating, transit management must take action on this hazard to reduce their exposure to financial and personnel loss. Examples of several options for managing and reducing the risk of a fire in the dispatch room may include but are not limited to:

- ◆ install a fire suppression system in the dispatch room (risk control)
- ◆ request a courtesy fire inspection of the transit facility from the local fire department (risk control)
- ◆ use two way radios to dispatch transit vehicles (risk removal)
- ◆ forward calls from the central telephone number to cellular phones (risk control)
- ◆ use a manual system, such as log sheets, with trip information for each transit vehicle (risk removal)
- ◆ provide a fire alarm system throughout the transit facility (risk control)
- ◆ instruct office personnel on proper evacuation of transit facilities (risk control)
- ◆ purchase special insurance for dispatch equipment (risk transfer)
- ◆ evaluate insurance policies for current replacement values (risk acceptance)

Follow-up

It is necessary to monitor the effectiveness of corrective actions and ensure that new hazards are not introduced as a result. An example of a corrective action may be the purchase of low floor vehicles to reduce passenger trips and falls. The low floor may cause vehicles to bottom out at high profile railroad grade crossings, so routes may need to be reviewed and rerouted.

As well, any changes through new contracts and agreements, new regulations and legislation, and any changes in system operations should have a hazard analysis conducted to identify and resolve any new hazards.

Section 6

References and Resources

American Public Transportation Association (APTA) Bus Safety Management Program

“Manual for the Development of Bus Transit System Safety Program Plans”

Capital Metropolitan Transportation Authority (CapMetro) Austin, TX

Center for Transportation Research, University of Texas at Austin

“Evaluation of Software Solutions for Transit Scheduling and Data Integration Needs”
Nov. 2002

Colorado Department of Transportation, Transit Unit

“Transit Safety and Security Prototype Approach” Dec. 2002

Community Council of Southwest Texas, Inc. Uvalde, TX

Dallas Area Rapid Transit (DART) Dallas, TX

Department of Public Safety License & Weight Service

“A Texas Motor Carrier’s Guide to Highway Safety” March, 2003

Federal Emergency Management Agency – The Emergency Program Manager

Federal Motor Carrier Safety Administration (FMCSA)

“Accident Countermeasures”

Federal Transit Administration (FTA)

“Transit System Security Program Planning Guide”

“Critical Incident Management Guidelines”

“Bus and Passenger Accident Prevention”

“Hazard Analysis Guidelines for Transit Projects”

Hill Country Transit District (The HOP) San Saba, TX

Metropolitan Transit Authority of Harris County (METRO) Houston, TX

System Safety Program Plan January 3, 2003

National Center for Transit Research – University of South Florida

“Analysis of Florida Transit Bus Accidents”

National Highway Traffic Safety Administration – (CODES)

Crash Outcome Data Evaluation System

National Highway Traffic Safety Administration – National Center for Statistics & Analysis

National Safety Council (NSC) “A Guide to Determine Motor Vehicle Accident Preventability”

National Transit Institute (NTI) “Workplace Health and Safety Resource”

National Transportation Safety Board – Highway Special Investigation Report

PB99-917006 NTSB/SIR-99/04 “Bus Crashworthiness Issues”

New York State Department of Transportation

North Carolina Department of Motor Vehicles “Commercial Bus Crashes in North Carolina”

Ohio Department of Transportation – Office of Public Transportation

Regional Transportation Authority (RTA) Corpus Christi, TX

Accident Review Board Policy March 15, 1995

Rural Transit Assistance Program (RTAP) “Risk Management for Rural Transit Systems”
Technical Assistance Brief #8, Revised 2001, prepared by Community Transportation
Association of America (CTAA)

Texas Transportation Institute (TTI) “Emergency Management for Public Transportation
Systems: Research Report (Tasks 3 and 4)”

Transport Workers Union of America – Health and Safety Fact Sheets

Transportation Research Board Transit Cooperative Research Program

“Bus Occupant Safety”

Transportation Safety Institute (TSI) “Fundamentals of Bus Collision Investigation”

“Instructors Course in Bus Operator Training”

“Transit Bus System Safety”

Wisconsin Department of Transportation – Bus Safety Manual

Section 7

Appendix

Appendix A – Employee's Account

EMPLOYEE'S ACCOUNT	
Describe the Incident/Include details:	
Where did this occur:	<hr/>
When did this occur:	<hr/>
What were you doing just prior to the incident:	<hr/> <hr/> <hr/>
How did this incident occur:	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>
How do you think this incident could have been prevented:	<hr/> <hr/> <hr/> <hr/>
The above statement is true and correct to the best of my knowledge.	
Signature	_____ Date ____/____/____ Time _____

Appendix B – DART Accident Report Form

DART DALLAS AREA RAPID TRANSIT		DRIVER'S ACCIDENT REPORT FORM		FILE NUMBER	
Grey Shaded Sections Are For RISK MANAGEMENT Use ONLY					
RISK USE ONLY	DATE	COST CENTER	OPER/N-OPER	CLASS CODE	QUAD
	TIME	RMIS STREET ONE		RMIS STREET TWO	
PRELIMINARY INFORMATION	DIVISION	DATE OF ACCIDENT: MONTH DATE YEAR	TIME OF ACCIDENT	DAY OF WEEK:	
	<input type="checkbox"/> 1-ED <input type="checkbox"/> 4-NW <input type="checkbox"/> 2-OC <input type="checkbox"/> 5-S&I <input type="checkbox"/> 3-EG <input type="checkbox"/> 6-Other	<input type="checkbox"/> MON <input type="checkbox"/> TUE <input type="checkbox"/> WED <input type="checkbox"/> THU <input type="checkbox"/> FRI <input type="checkbox"/> SAT <input type="checkbox"/> SUN ACCIDENT OCCURRED: on STREET 1 _____ STREET 2 _____	<input type="checkbox"/> AM <input type="checkbox"/> PM		
DRIVER INFORMATION	CITY	<input type="checkbox"/> 01 - Dallas <input type="checkbox"/> 02 - Addison <input type="checkbox"/> 03 - Buckingham <input type="checkbox"/> 04 - Carrollton <input type="checkbox"/> 05 - Coppell	<input type="checkbox"/> 06 - Farmers Branch <input type="checkbox"/> 07 - Flower Mound <input type="checkbox"/> 08 - Garland <input type="checkbox"/> 09 - Glenn Heights <input type="checkbox"/> 10 - Highland Park	<input type="checkbox"/> 11 - Irving <input type="checkbox"/> 12 - Plano <input type="checkbox"/> 13 - Richardson <input type="checkbox"/> 14 - Rowlett <input type="checkbox"/> 15 - University Park	<input type="checkbox"/> 16 - Cockrell Hill <input type="checkbox"/> 17 - Other _____
	Driver Name _____ Address _____ <input type="checkbox"/> Operator <input type="checkbox"/> Student <input type="checkbox"/> Other	HOME PHONE	PAYROLL NUMBER	AGE	<input type="checkbox"/> Male <input type="checkbox"/> Female
ACCIDENT SCENE INFORMATION	TYPE OF ACCIDENT/INCIDENT: <input type="checkbox"/> 01 - Boarding/Alighting Accident <input type="checkbox"/> 02 - On Board Passenger Accident <input type="checkbox"/> 03 - Collision of Vehicles <input type="checkbox"/> 04 - Collision with Pedestrian/Bicycle <input type="checkbox"/> 05 - Collision with Fixed/Stationary Object <input type="checkbox"/> 06 - Incident, Disturbance, Sickness, Vandalism, etc. <input type="checkbox"/> 07 - Derail <input type="checkbox"/> 08 - Trail a Switch <input type="checkbox"/> 09 - Near Miss <input type="checkbox"/> 10 - Witness Report				
	TRAFFIC CONDITIONS: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 02 - Medium <input type="checkbox"/> 01 - Heavy <input type="checkbox"/> 03 - Light				
	TRAFFIC CONTROLS: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - Stop Sign <input type="checkbox"/> 01 - Flashing Light <input type="checkbox"/> 04 - Signal <input type="checkbox"/> 02 - Yield Sign <input type="checkbox"/> 05 - None <input type="checkbox"/> 06 - Officer/School Crossing Guard <input type="checkbox"/> 07 - Turn Restricted <input type="checkbox"/> 08 - Other				
	ROAD/TRACK CONDITIONS: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - Wet Road / Flood Area <input type="checkbox"/> 01 - Repairing Road <input type="checkbox"/> 04 - Muddy <input type="checkbox"/> 06 - Snow on Road <input type="checkbox"/> 02 - Dry Road <input type="checkbox"/> 05 - Ice on Road <input type="checkbox"/> 07 - Slushy				
	LIGHTING CONDITIONS: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 02 - Daylight <input type="checkbox"/> 01 - Dawn/Dusk <input type="checkbox"/> 03 - Dark				
DART VEHICLE INFORMATION	STREET LIGHTS: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - Street Lights On (if applicable) <input type="checkbox"/> 01 - Defective Street Lights <input type="checkbox"/> 04 - Street Lights Off <input type="checkbox"/> 02 - No Street Lights				
	WEATHER: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - Rain <input type="checkbox"/> 01 - Fog/Mist <input type="checkbox"/> 04 - Snow <input type="checkbox"/> 02 - Clear <input type="checkbox"/> 05 - Sleet				
	Number of vehicles involved (include the DART vehicle in the count): _____				
	OTHER: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - 18 Wheel Truck (Semi) <input type="checkbox"/> 07 - Taxi <input type="checkbox"/> 11 - Other VEHICLE: <input type="checkbox"/> 01 - Passenger Auto/St Wagon <input type="checkbox"/> 04 - Motorcycle/Moped <input type="checkbox"/> 08 - Fixed/Stationary Object <input type="checkbox"/> 12 - None TYPE: <input type="checkbox"/> 02 - Passenger Truck, Van, Blazer, Bronco, Wrecker <input type="checkbox"/> 05 - Bicycle/Skateboard <input type="checkbox"/> 09 - Fire Engine, Ambulance, Trailer <input type="checkbox"/> 13 - LRV <input type="checkbox"/> 06 - Bus <input type="checkbox"/> 10 - Pedestrian				
	The total number of people injured in the other vehicle was: _____				
PASS. ACC. INFO.	If DART vehicle and pedestrian/cyclist collision: PEDESTRIANS CLOTHING: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 01 - Light Clothing <input type="checkbox"/> 02 - Dark Clothing <input type="checkbox"/> 03 - N/A				
	Where was pedestrian/cyclist at the time of the accident: <input type="checkbox"/> At crosswalk/intersection <input type="checkbox"/> In Loading Zone <input type="checkbox"/> Jay Walking <input type="checkbox"/> Other _____				
	VEHICLE #s	RUN/TRAIN #	ROUTE #	LINE DESCRIPTION <input type="checkbox"/> Charter <input type="checkbox"/> N/A <input type="checkbox"/> Unknown	
	DART VEHICLE TYPE: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 03 - Truck/Blazer/Bronco <input type="checkbox"/> 06 - Garbage Truck <input type="checkbox"/> 08 - LRV <input type="checkbox"/> 01 - Bus <input type="checkbox"/> 04 - Van <input type="checkbox"/> 07 - Other: <input type="checkbox"/> 09 - Motorcycle <input type="checkbox"/> 02 - Passenger Auto <input type="checkbox"/> 05 - Wrecker				
	Number of Passengers: _____ How far were you from point of accident when: Passengers injured: _____ Other vehicle/pedestrian was first seen? _____ ft Courtesy cards obtained: _____ You applied brakes? _____ ft				
MISC.	Estimated speed of DART vehicle: _____ mph When first notice danger: _____ mph At time of impact: _____ mph				
	SEVERITY OF INJURY: <input type="checkbox"/> 99 - Unknown <input type="checkbox"/> 02 - Fatality <input type="checkbox"/> 04 - No visible injury-driver not notified <input type="checkbox"/> 01 - Injured <input type="checkbox"/> 03 - None <input type="checkbox"/> 05 - Complaint of pain-no visible injury				
	At the time of accident was person: <input type="checkbox"/> Boarding <input type="checkbox"/> Alighting <input type="checkbox"/> On board <input type="checkbox"/> Not on board				
	If boarding or alighting, at: <input type="checkbox"/> Front doors <input type="checkbox"/> Rear doors <input type="checkbox"/> LRV Door # _____				
	Condition of steps: <input type="checkbox"/> Dry <input type="checkbox"/> Wet from water, snow, ice				
PERSONS INVOLVED/INJURED	Motion of DART vehicle at time of accident: <input type="checkbox"/> Starting <input type="checkbox"/> Stopping <input type="checkbox"/> Standing Still <input type="checkbox"/> Moving				
	Was there any miscellaneous property damage (fence, landscaping, etc.)? <input type="checkbox"/> No <input type="checkbox"/> Yes Was DART vehicle involved? <input type="checkbox"/> No <input type="checkbox"/> Yes If not give distance from DART vehicle: _____ ft				
	In case of glass broken: <input type="checkbox"/> Vandalism <input type="checkbox"/> Non-Vandalism				
Were police at scene of accident? <input type="checkbox"/> Yes <input type="checkbox"/> No Police Officer(s) at scene: _____ Police Report Number: _____ DART Supervisor investigating: _____					
White-Office of Risk Management Canary-Respective Division Supervisor / Manager Pink-Respective Division Safety Supervisor Goldenrod-Safety Manager					

[illegible]

Appendix C – TxDOT Reporting Form for Security Incidents

Form PTN-100 (Rev. 7/2002)
Page 1 of 2

TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) PROCEDURES FOR REPORTING SECURITY INCIDENTS

The Public Transportation Division (PTN) shall be notified of each security incident involving a Section 5307 (small urban), 5310, or 5311 transit agency. Section 5307 (MTA) transit providers are not required to report security incidents.

Notification shall occur by mail, E-mail, or facsimile, within five (5) days of the occurrence or discovery of each security incident. The information on this form shall be reported directly to the district Public Transportation Coordinator (PTC), who will then forward the form and any additional documentation to PTN.

A security incident is any unforeseen event or occurrence that may endanger human life or property. The following definitions for a reportable security incident are derived from the Federal Bureau of Investigation (FBI) Uniform Crime Reporting (UCR) Program. PTN defines a reportable security incident as one with any of the following consequences:

- Homicide: the killing of one human being by another, including murder and manslaughter;
- Forcible Rape: the carnal knowledge of a person, forcibly and/or against that person's will;
- Robbery: taking, or attempting to take, anything of value from another person by force, threat of force, or violence, thereby putting the victim in fear of harm;
- Aggravated Assault: an unlawful attack by one person upon another wherein the offender uses a weapon or displays it in a threatening manner, or the victim suffers obvious severe or aggravated bodily injury;
- Burglary: unlawful entry into a building or other structure with the intent to commit a felony or theft;
- Motor Vehicle Theft: theft of a motor vehicle;
- Arson: to unlawfully and intentionally damage, or attempt to damage, any property by fire or incendiary device;
- Bomb Threat: credible written or oral communication to a transit agency threatening the use of an explosive or incendiary device for the purpose of disrupting public transit services or to create a public emergency;
- Bombing: unlawful and intentional delivery, placement, discharge, or detonation of an explosive or other lethal device in, into, or against a public transport facility (including vehicles);
- Chemical or Biological release: unlawful and intentional delivery, placement, discharge, or detonation of a biological or chemical lethal device in, into, or against a public transport facility (including vehicles);
- Hijacking: unlawful seizure or control of a transit vehicle;
- Kidnapping: unlawful seizure, transportation, and/or detention of a person against his/her will or of a minor without the consent of his/her custodial parent(s) or legal guardian.

Any questions regarding this reporting form should be directed to the district PTC.

The Texas Department of Transportation maintains the information collected through this form. With few exceptions, you are entitled upon request to be informed about the information that we collect about you. Under §552.021, §552.023, and §559.004 of the Texas Government Code, you are entitled to receive and review the information and to have us correct erroneous information.

TRANSIT AGENCY:
Security Contact Person:
Area Code and Phone Number:

DATE of INCIDENT:	INCIDENT TIME:	AM <input type="checkbox"/> PM <input type="checkbox"/>	COUNTY:
LOCATION:			
# OF FATALITIES:	# OF INJURIES:	PROPERTY DAMAGE ESTIMATE: \$	

Homicide	<input type="checkbox"/>	Burglary	<input type="checkbox"/>	Bombing	<input type="checkbox"/>
Forcible Rape	<input type="checkbox"/>	Motor Vehicle Theft	<input type="checkbox"/>	Chemical or Biological Release	<input type="checkbox"/>
Robbery	<input type="checkbox"/>	Arson	<input type="checkbox"/>	Hijacking	<input type="checkbox"/>
Aggravated Assault	<input type="checkbox"/>	Bomb Threat	<input type="checkbox"/>	Kidnapping	<input type="checkbox"/>

DESCRIPTION OF INCIDENT:	ATTACH LAW ENFORCEMENT REPORT(S) IF AVAILABLE
---------------------------------	---

PREPARED BY:		DATE:
TITLE:	PHONE NUMBER:	

THIS REPORT SHOULD BE COMPLETED AND SUBMITTED TO THE TxDOT DISTRICT PUBLIC TRANSPORTATION COORDINATOR FOR EACH REPORTABLE SECURITY INCIDENT NO LATER THAN 5 DAYS AFTER THE OCCURRENCE OR DISCOVERY OF EACH INCIDENT.

Appendix D – TxDOT Reporting Form for Transit Vehicle Incidents

Form PTN-101 (Rev. 7/2002)
Page 1 of 3

TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) PROCEDURES FOR REPORTING TRANSIT VEHICLE INCIDENTS

The Public Transportation Division (PTN) shall be notified of each incident involving a transit vehicle used in the Section 5307 (small urban), 5310, or 5311 programs. Section 5307 (MTA) transit providers are required only to report fatalities.

The definition of transit vehicle includes buses, rubber-wheeled trolleys, standard vans, conversion vans, or automobiles. Notification shall be made regardless of the funding source of the vehicle or whether the service is directly operated or purchased transportation.

Notification shall occur by mail, E-mail, or facsimile, within five (5) days of the occurrence or discovery of each reportable incident. The information on this form shall be reported directly to the district Public Transportation Coordinator (PTC), who will then forward the form and any additional documentation to PTN.

PTN defines a reportable incident as one with any of the following consequences:

- An individual dies within 30 days of a transit incident;
- An individual suffers bodily injury and immediately receives medical treatment away from the scene of the incident. Medical attention sought after leaving the scene of an incident is not reportable;
- Total damage exceeds \$7,500 (including other vehicles and property);
- The transit vehicle incurs disabling damage as the result of the incident and is removed from revenue service;
- A non-arson fire occurs in any vehicle involved in the incident, revenue facility, or non-revenue facility.

Disabling damage means damage that prevents the transit vehicle from departing the scene of the incident in its usual manner; including vehicles that could have been operated but would have been further damaged if so operated. This does not include damage that could be remedied temporarily at the scene of the incident with standard tools or parts. Tire disablement or inoperable headlights, taillights, turn signals, horn, or windshield wipers are not considered disabling damages.

Transit vehicle equipment failures, which result in a reportable incident, should be noted in the incident description section. Examples of vehicle equipment include batteries, the electrical system, brakes, fuel tanks, the propulsion system, safety devices, the steering system, tires, wheels, axles, and wheelchair securement devices.

The incident description should include, but is not limited to, the following basic information: causal factors of the incident, the direction in which the vehicles were traveling, and road and weather conditions. Law enforcement reports should also be submitted when available.

Any questions regarding this reporting form should be directed to the district PTC.

The Texas Department of Transportation maintains the information collected through this form. With few exceptions, you are entitled upon request to be informed about the information that we collect about you. Under §552.021, §552.023, and §559.004 of the Texas Government Code, you are entitled to receive and review the information and to have us correct erroneous information.

Form PTN-101
(Rev. 7/2002)
Page 3 of 3

DESCRIPTION OF INCIDENT: ATTACH LAW ENFORCEMENT REPORT(S) IF AVAILABLE	

PREPARED BY:		DATE:
TITLE:		PHONE NUMBER:

THIS REPORT MUST BE COMPLETED AND SUBMITTED TO THE TxDOT DISTRICT PUBLIC TRANSPORTATION COORDINATOR FOR EACH REPORTABLE INCIDENT NO LATER THAN 5 DAYS AFTER THE OCCURRENCE OR DISCOVERY OF EACH REPORTABLE INCIDENT.

Appendix E – Courtesy Card

Courtesy Card Examples:

Spanish



Su Ayuda es Apreciada

...es me trabajo obtener los nombres de las personas presente.

Nombre _____

Domicilio _____

_____ Teléfono _____

¿Usted estuvo en el accidente? _____ ¿Fue usted lastimado? _____

¿vio lo que paso? _____ ¿Fue lastimado alguno? _____

¿De quien fue la culpa del accidente? _____

Fecha _____ BUS# _____

English



I'd Appreciate Your Help

... It's my job to get the name of every person present.

NAME _____

ADDRESS _____

_____ PHONE NO. _____

WERE YOU INVOLVED? _____ WERE YOU HURT? _____

DID YOU SEE WHAT HAPPENED? _____ WAS ANYONE HURT? _____

WHOSE FAULT WAS THE ACCIDENT? _____

DATE _____ BUS# _____

Appendix F – Collision Scene Checklist

Checklist for gathering information at the collision scene and limiting liability

It is important to gather as much information as possible at the collision scene. Complete the collision report as soon as possible while the details gathered are still fresh in your mind.

From police officers:

- Name
- Badge number
- Department
- Time of arrival

From passengers:

- Name
- Address and phone number
- Number of customers
- Type and location of injuries
- Their account of the collision

From other drivers:



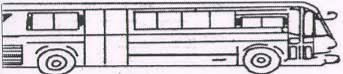


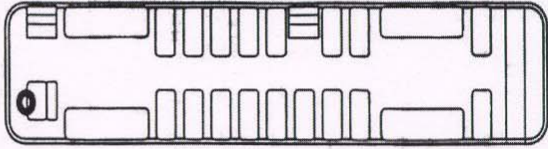
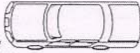

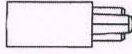
- Description of new and old damage to car
- Name, address, and phone number of driver
- Name, address, and phone number of any passengers
- Make, color, license plate, and VIN number of car

Suggestions to limit the liability of your company:

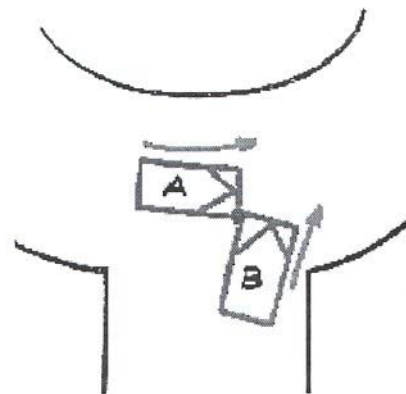
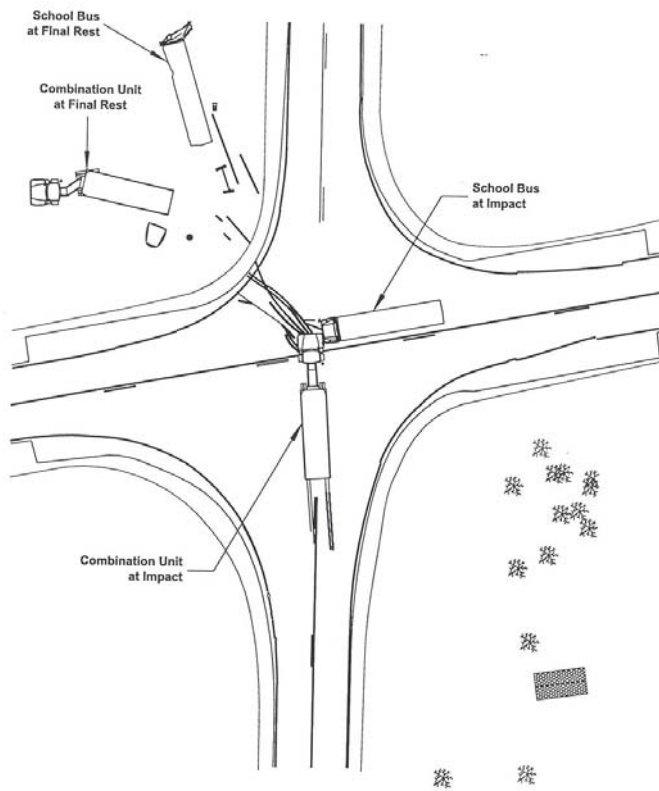
- Do not move the bus unless you are told to by your supervisor or police officer
- Count the number of customers on the bus at the time of the collision
- Give only required information to others
- If discussing the incident with your supervisor, do so in private
- Talk in a low voice that cannot be overheard when speaking with the dispatcher
- Never say you will contact anyone directly
- Collect courtesy cards from as many people as possible
- Never admit fault
- Refer others to the risk management department
- Do not offer opinions
- Provide only facts that pertain to the incident and only to police officers

Appendix G – Supervisor Accident/Incident Report

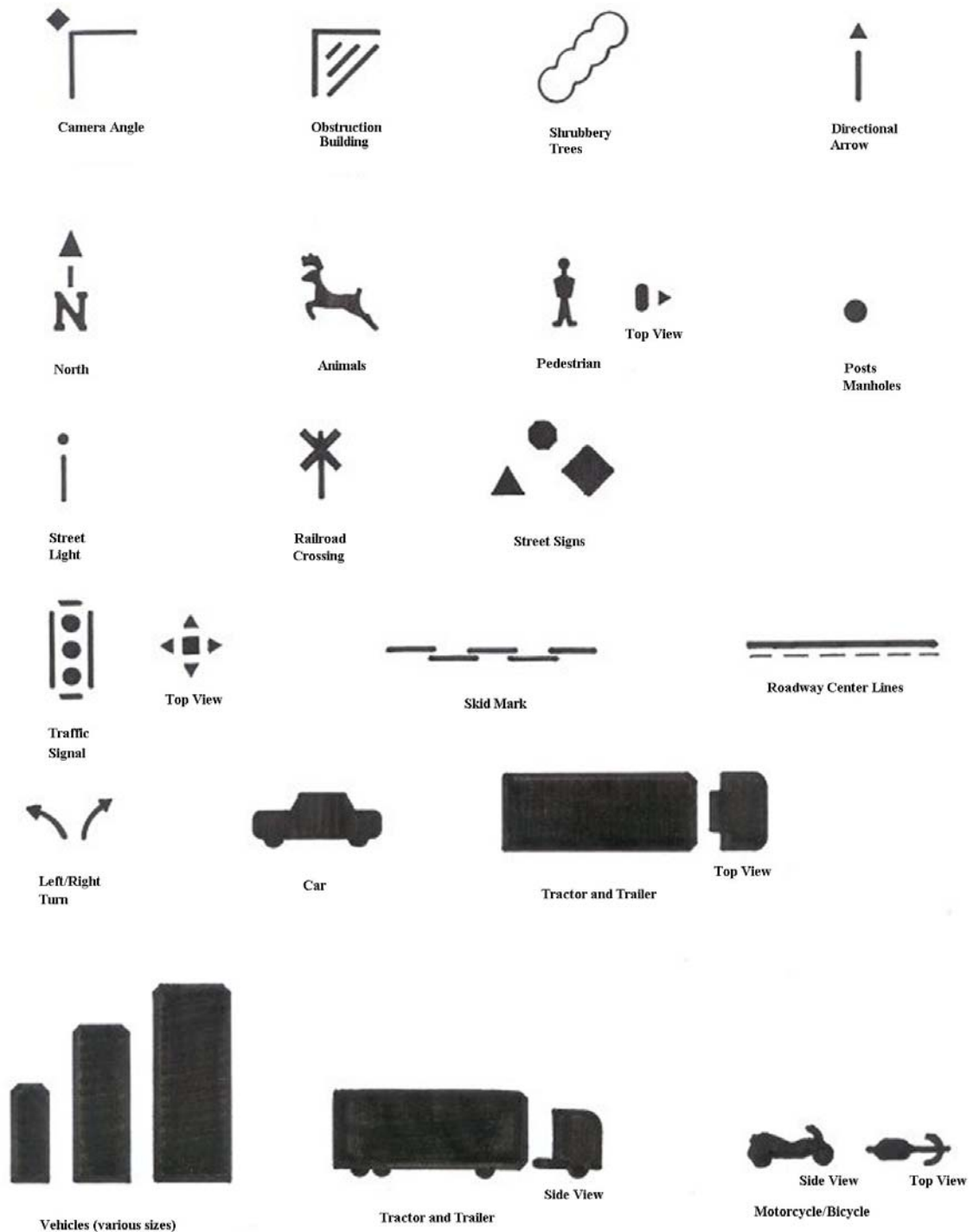
CAPITAL METRO		STARTRAN SUPERVISOR ACCIDENT / INCIDENT REPORT FORM				CMTA #	
DATE		Daytime:		Compass direction:			
Time:				Bus #		Block:	
Supervisor Name:		T#		Response time:			
Name of Operator:		ID #					
Address:				Police on scene?			
				Report/Case #			
				CITATION			
				Officers Badge #			
Road Conditions:		Weather Conditions:		PASSANGERS IN VEHICLE #1		In #2	
Was bus in motion at time of incident:							
Approx. speed just prior to impact:							
Approximate speed at impact:							
Were photos taken?				Was service delayed?		Q-bus:	
If no, why not?				Was the line adjusted?			
Rolls of film used:		Digital?		Missed trips:		Time delayed:	
CMTA veh. towed?				Number of Courtesy cards collected:			
Is operator required to be tested?				By whom:			
VEHICLE # 2 INFORMATION:		Drivers Name:					
ADDRESS		CITY		State:			
License #		Make:		Model:		Year:	
State:		Description of damage to Vehicle # 2:					
Veh. # 2 towed?				Insurance Co.:			
Policy #							
Additional Info:							
VEHICLE # 3 INFORMATION:		Drivers Name:					
Address:		City:		State:		Zip:	
Drivers License #		Make:		Model:		Year:	
License #		State:		Description of damage to Vehicle # 2:			
Veh. # 2 towed?				Insurance Co.:			
Policy #							
Additional Info:							
Witnesses and Injured Parties							
1	Name:	Address:		Phone:			
	Witness:						
	EMS Notified:	Transported?		N			
2	Name:	Address:		Phone:			
	Witness:						
	EMS Notified:	Transported?		Hospital			
3	Name:	Address:		Phone:			
	Witness:						
	EMS Notified:	Transported?		Hospital			
Witnesses and Injured Parties (cont.)							
4	Name:	Address:		Phone:			
	Witness:						
	EMS Notified:	Transported?		Hospital			
5	Name:	Address:		Phone:			
	Witness:						
	EMS Notified:	Transported?		Hospital			

Summary of Accident:	
Diagram of Accident:	
Indicate Vehicle Damage on appropriate vehicle Indicate location of any injured passengers on diagram of bus	
 Left Side	 Rear
 Right Side	 Front
 Trailer Truck	
	
 Front	 Car
 Truck	
I certify that all of the information on this report is correct to the best of my knowledge.	
Signature:	BETO REYNA
Date: 10/15/02	

Appendix H – Accident Sketches



Appendix I – Character Template



Appendix J – Supervisor's Investigation Report

INVESTIGATION REPORT

This Incident Report is to be completed by a Supervisor and submitted to the Personnel Department within twenty-four hours of the incident. If the employee is unable to complete his/her account of the incident, the supervisor is to provide the information, in addition to the analysis of the incident. An employee account is required.

GENERAL INFORMATION:

Name		Date of Birth		Social Security
Home address		City	State	ZIP
Date and Time of Incident		Date Incident Was Reported	Department and Job Title	
Specific Location of Incident (Dept., Street, Road)		Date of Hire		
Home Telephone Number				
Length of Time on Current Job				
Photographs Taken By				

INJURY INCIDENT

When Injury/Illness occurs on the job, Supervisors will:

1. Determine the extent and nature of the injury/illness. See that proper first aid is applied to prevent shock, bleeding, etc. Activate EMS (911), if necessary.
2. Accompany the employee to a doctor if the employee is unable to drive.
3. If not an emergency, send a return to work form with the employee.
4. Complete an Injury Investigation Report. In case of fatality or serious injury, notify Personnel Department immediately.
5. Determine the cause of incident and correct the hazard to prevent recurrence.
6. Replenish the first aid supply after use.
7. Advise Personnel Dept. when an employee returns to work. Request a doctor's release before permitting return. Be sure the employee is capable of resuming his/her work.

Type of Injury: <input type="checkbox"/> A. Bruise <input type="checkbox"/> F. Burns <input type="checkbox"/> B. Strain/Sprain <input type="checkbox"/> G. Foreign body <input type="checkbox"/> C. Puncture/Cut <input type="checkbox"/> H. Disoriented <input type="checkbox"/> D. Fracture <input type="checkbox"/> I. Infection <input type="checkbox"/> E. Amputation <input type="checkbox"/> J. Other		Type of Incident: <input type="checkbox"/> A. Caught between <input type="checkbox"/> F. Struck against <input type="checkbox"/> B. Struck by <input type="checkbox"/> G. Slip, trip, fall <input type="checkbox"/> C. Ingested/Inhaled <input type="checkbox"/> H. Strain, Over exertion <input type="checkbox"/> D. String/bite <input type="checkbox"/> I. Lifting, pulling, etc. <input type="checkbox"/> E. Burns <input type="checkbox"/> J. Other	
Part of Body Injured: <input type="checkbox"/> Head <input type="checkbox"/> Mouth <input type="checkbox"/> Hand <input type="checkbox"/> Leg <input type="checkbox"/> Toe <input type="checkbox"/> Neck <input type="checkbox"/> Shoulder <input type="checkbox"/> Finger <input type="checkbox"/> Knee <input type="checkbox"/> Back <input type="checkbox"/> Eye(s) <input type="checkbox"/> Arm <input type="checkbox"/> Elbow <input type="checkbox"/> Foot <input type="checkbox"/> Internal <input type="checkbox"/> Other		Severity of Injury: <input type="checkbox"/> Medical Treatment <input type="checkbox"/> Restricted Duty <input type="checkbox"/> Lost Time <input type="checkbox"/> Fatality <input type="checkbox"/> First Aid Only	

Did the employee lose time from work due to the incident? ☐ Yes ☐ No

Last day worked: _____

Did the employee go to an Emergency Room? ☐ Yes ☐ No Facility Name _____ Doctor _____

List Witnesses: 1. _____ 2. _____

Appendix K – Supervisor's Incident Report

SUPERVISOR'S INCIDENT REPORT					
<input type="checkbox"/> Div. Director <input type="checkbox"/> Local Safety Specialist <input type="checkbox"/> Safety Director <input type="checkbox"/> Local Manager		Case or File # _____			
Site _____		Sex _____		Date of Birth _____	
Specific site location _____ (office #, maintenance area, etc.)					
Employee Name _____		Social Security No. _____			
Home Address _____		City _____		Zip _____	
Job Title _____		Date Hired _____		Time on Job (yrs.) _____	
Date of Injury/Illness _____ MM / DD / YY		Time Employee began work _____ a.m. p.m.		Time of Injury/Illness _____ a.m. p.m.	
Date Reported to Supervisor _____ MM / DD / YY		Employee's Division _____			
Place of Injury: On Premises? <input type="checkbox"/> YES <input type="checkbox"/> NO		Address where injury/illness occurred _____ (Street, City, State, Zip Code)			
CLASSIFICATION: <input type="checkbox"/> Major <input type="checkbox"/> Off Work <input type="checkbox"/> Restricted Work <input type="checkbox"/> No Lost Work <input type="checkbox"/> Non-Recordable <input type="checkbox"/> Property Damage Only					
INCIDENT TYPE: <input type="checkbox"/> Fall <input type="checkbox"/> Fire <input type="checkbox"/> Auto Accident <input type="checkbox"/> Improper Lifting <input type="checkbox"/> Electrical Contact <input type="checkbox"/> Other					
Witness to incident: Name _____		Did employee die? _____ yes _____ no			
Phone # _____		If employee died, date of death _____			
If the case involved days away from work or restricted work activity, enter the date the employee returned to work at full capacity _____					
Number of restricted workdays _____		Number of lost workdays _____			
Name all equipment, materials and/or chemicals employee was using when the event occurred (e.g. Acetylene cutting torch, metal plate)					
Specify activity the employee was engaged in when the event occurred (e.g. cutting metal plate for flooring). Indicate if activity was part of normal job duties.					
How did the injury or illness occur? Describe the sequence of events and include any objects or substances that directly injured or made the employee ill. (e.g. worker stepped back to inspect work and slipped on some scrap metal. As worker fell, worker brushed against the hot metal.)					
Describe Injury/Illness and Indicate Body Part Affected (e.g. broken left index finger, dermatitis, etc.)					
Description of Medical Treatment (e.g. stitches, prescription medication, etc.)					
Was employee treated by a physician? _____ yes _____ no					
Name of health care provider and address (If hospital was involved, give name and address of hospital)					
Hospitalized overnight as in-patient? <input checked="" type="checkbox"/> yes _____ no (If emergency room only, mark "no")					
Action taken or that will be taken to prevent recurrence					
Date of Report _____		Prepared By _____		Position _____	
SIGNATURES					
Supervisor _____		Safety Dir. _____		Site Manager _____	
Div. Director _____		Div. Safety Rep. _____			

ACCIDENT BREAKDOWN BY CHARACTERISTIC

Nature of Injury

- ☐ Amputation or Enucleation
- ☐ Burn or Scald
- ☐ Contusion, Bruise
- ☐ Cut (Puncture)
- ☐ Rash, From Plants
- ☐ Rash, Not From Plants (Dermatitis)
- ☐ Electric Shock
- ☐ Inhalation Injury-Toxic Substance
- ☐ Freezing, Frostbite
- ☐ Hearing Loss or Impairment
- ☐ Heat Exhaustion, Sunstroke
- ☐ Hernia or Rupture
- ☐ Scratches, Abrasions
- ☐ Sprain, Strains
- ☐ Fracture
- ☐ Multiple Injuries
- ☐ Insect Bites
- ☐ Needle Puncture
- ☐ Other

Part of Body Affected By Injuries

- ☐ Head
- ☐ Eyes (Including Vision)
- ☐ Arm(s) (Above Wrist)
- ☐ Hand (Including Wrist)
- ☐ Finger(s)
- ☐ Up Extremity, Multiple Parts
- ☐ Abdomen (Including Internal Organs)
- ☐ Back (Including Muscles, Spine)
- ☐ Chest (Including Internal Organs)
- ☐ Hips (Including Pelvic Organs)
- ☐ Shoulder(s)
- ☐ Trunk, Multiple Parts
- ☐ Leg(s) (Above Ankle)
- ☐ Foot (Including Ankle)
- ☐ Toe(s)
- ☐ Low Extremity, Multiple Parts
- ☐ Low Extremity, Nec
- ☐ Multiple Parts of Body, Severe
- ☐ Digestive System
- ☐ Respiratory System
- ☐ Circulatory System
- ☐ Skin
- ☐ Other

Type of Accidents Resulting in Injuries

- ☐ Struck Against Object
- ☐ Struck By Flying Object
- ☐ Struck By Other Object/Person
- ☐ Falls (All Types)
- ☐ Caught In, Under, Or Between
- ☐ Rubbed Or Abraded By Object
- ☐ Bodily Reactions (Sprains, Strains, Rupture, Etc.)
- ☐ Contact With Temperature Extremes
- ☐ Electrical Shock
- ☐ Toxic Materials Exposure
- ☐ Noise Exposure
- ☐ Disease Exposure
- ☐ Repetitive Motion
- ☐ Vehicle or Equipment Accident
- ☐ Accident Type, Other

Safety Equipment in Use

- ☐ Hard Hat
- ☐ Safety Glasses
- ☐ Respirator
- ☐ Movable Exhaust Hood
- ☐ Ear Protection
- ☐ Safety Shoes
- ☐ Shoulder Harness
- ☐ Reflective Vests
- ☐ Flags
- ☐ Seat Belts
- ☐ Chemical Aprons
- ☐ Face shields
- ☐ Gloves
- ☐ Reflective Triangles
- ☐ Warning & Control
- ☐ Other Restraining Devices
- ☐ Safety equipment, NEC
- ☐

Appendix L – Bus Safety Inspection Checklist

BUS SAFETY INSPECTION CHECKLIST

The following checklist is provided to assist transit system safety personnel in the inspection of the buses in their system. It is intended to provide guidance to the transit system on what safety issues should be examined when a bus is inspected by the safety office. It may also be employed to provide maintenance personnel with guidance on what safety items need to be inspected at regular intervals. Finally, not all buses will contain the equipment on the inspection list. From a procurement perspective, it also provides a list of items that should be considered in the procurement of future buses.

OPERATIONAL SAFETY ISSUES

1. Low air warning alarm (audible)
2. Air leaks when bus systems are operating
3. Service brake application
4. Parking brake application
5. Brake interlock
6. Accelerator interlock
7. Emergency engine stop
8. Front door operation
9. Rear door operation
10. Windshield wiper/washer
11. Passenger signal system
12. Emergency exit door
13. Exit door warning
14. Back-up alarm
15. Wheelchair lifts and securement devices
16. Steering operation/free play
17. Road test

UNDERCARRIAGE ITEMS

1. Front axle components
 - Lines
 - Brakes
 - Shocks
 - Suspension
 - Bracket/mounts
2. Steering components
 - Tie/rod/ends
 - Steering lines
 - Drag link
 - Shaft/joints
 - Gear box
 - Free play
3. Batteries/cables
4. Fuel tank lines
5. Rear brakes

ENGINE COMPARTMENT

1. Electrical box/wires
2. Electrical harness/cables
3. Power steering lines
4. Oil lines
5. Air lines
6. Fuel lines
7. Engine cradle hangers
8. Oil/fuel leak on/near exhaust components
9. Fire detection and suppression system

BUS INTERIOR

1. Driver's seat belt
2. Passenger seats
3. Wheelchair tie down
4. Grab rail/stanchions
5. Interior mirrors
6. Interior lighting
7. Stepwell - front
8. Stepwell - rear
9. Emergency exit - door
10. Emergency exit - window
11. Roof escape hatch operation
12. Radio communications
13. Horn
14. Brake pedal
15. Accelerator pedal
16. Fire extinguisher/charge date
17. Steering wheel/column
18. First aid kit
19. Reflectors
20. Sharp edges
21. Trash in bus (i.e., electrical box)

EXTERIOR

1. Head lamps - low beam
2. Head lamps - high beam
3. Turn signals - front
4. Turn signals - side
5. Turn signals - rear
6. Reflectors
7. Parking clearance lamps
8. Tail lamps
9. Stop lamps
10. 4-way emergency flasher lamps
11. Back-up lamps
12. Front tires, left - inflation, tread, rims/nuts
13. Front tires, right - inflation, tread, rims/nuts
14. Rear tires, left - inflation, tread, rims/nuts
15. Rear tires, right - inflation, tread, rims/nuts
16. Windshield - glass
17. Windshield - harness
18. Windshield - wiper/washer
19. Windows, side
20. Mirror, right
21. Mirror, left

Appendix M – Generic Hazard Checklist

GENERIC HAZARD CHECKLIST

1. **BASIC DESIGN DEFICIENCIES**
 - A. Examples:
 1. Sharp corners
 2. Instability
 3. Excessive weight
 4. Inadequate clearance
 5. Lack of accessibility
 - B. Causes: Improper or Poor Design
 - C. Control Methods: Improve or Change Design
2. **INHERENT HAZARDS**
 - A. Examples:
 1. Mechanical (i.e., rotating equipment, vibration)
 2. Electrical
 3. Explosives
 4. Flammable gases or liquids
 5. Toxic substances
 6. Acceleration (flying objects)
 7. Deceleration (falling objects)
 8. Temperature
 - B. Cause: Integral Characteristic Which Cannot Be Designed Out
 - C. Control Methods:
 1. Safety devices
 - (a) Isolation (separation)
 - (b) Barriers (guards)
 - (c) Interlocks (deactivation)
 - (d) Pressure release
 - (e) Temperature sensor (fuse)
 2. Warning devices (five senses)
 - (a) Visual (sight) - color, shape, signs, light
 - (b) Auditory (hearing) - bell
 - (c) Tactile (touch) - shape, texture
 - (d) Olfactory (smell)
 - (e) Gustatory (taste)
 3. Procedures and training
 - (a) Use of safe procedures
 - (b) Training
 - (c) Backout/recovery procedures
 - (d) Protective equipment
 - (e) Emergency procedures
3. **MALFUNCTIONS**
 - A. Examples:
 1. Structural failures
 2. Mechanical malfunctions
 3. Power failures
 4. Electrical malfunctions
 - B. Causes:
 1. Faulty design
 2. Manufacturing defects
 3. Improper or insufficient maintenance
 4. Exceeding specified limits
 5. Environmental effects
 - C. Control Methods: Design
 1. Fail safe design
 2. Higher safety margins (i.e., reduce stress, increase load strength, etc.)
 3. Redundant circuitry or equipment

- 4. Timed replacement
- D. Other Control Methods: Safety Devices, Warning Devices, Procedures and Training (See Point 2C 1-3)

4. MAINTENANCE HAZARDS

- A. Examples:
 - 1. Improper connections
 - 2. Component failures
 - 3. Equipment damage
 - 4. Operational delay
- B. Causes:
 - 1. Lack of maintenance
 - 2. Improper maintenance
 - 3. Hazardous maintenance conditions
- C. Control Methods:
 - 1. Design
 - (a) Simplified design
 - (b) Fail-safe design.
 - (c) Easy access to equipment
 - (d) Elimination of need for special tools or equipment
 - 2. Safety devices
 - (a) Guards for moving parts
 - (b) Interlocks
 - 3. Warning devices
 - (a) Labels/signs
 - (b) Bells
 - (c) Chimes
 - (d) Lights
 - 4. Procedures or training
 - (a) Documentation of proper procedures
 - (b) Improved training courses
 - (c) Housekeeping

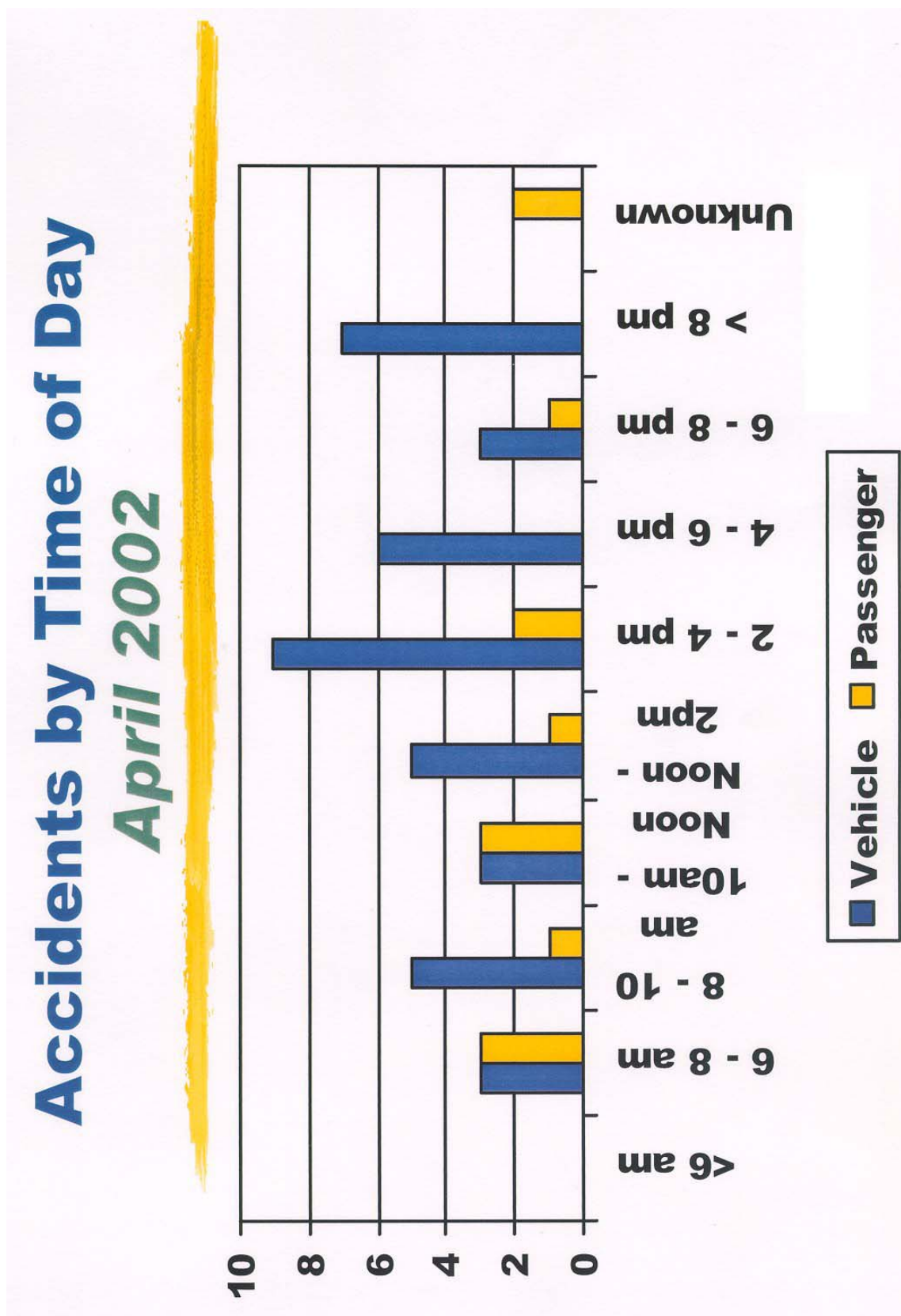
5. ENVIRONMENTAL HAZARDS

- A. Examples:
 - 1. Heat
 - 2. Cold
 - 3. Dryness
 - 4. Wetness
 - 5. Low friction (slipperiness)
 - 6. Glare
 - 7. Darkness
 - 8. Earthquake
 - 9. Gas or other toxic fumes
- B. Causes:
 - 1. Inherent
 - 2. Foreseen or unforeseen natural phenomena/conditions which do or could occur
- C. Control Methods [see also 4(c)]
 - 1. Design
 - (a) Increased resistance to temperature changes
 - (b) Increased resistance to dryness or wetness
 - (c) Fail-safe design
 - 2. Safety Devices
 - (a) Sufficient heating or cooling capability
 - (b) Adequate insulation
 - (c) Restricted access
 - (d) Temperature sensor
 - 3. Warning devices
 - (a) Visual
 - (b) Auditory

- (c) Olfactory
 - 4. Procedures and training
 - (a) Use of safe procedures
 - (b) Protective equipment
 - (c) Training
- 6. **HUMAN FACTORS**
 - A. Examples: (include review of all other items listed in 1-5)
 - 1. Stress (sensory, mental, motor)
 - 2. Physical surroundings (environment)
 - (a) Noise
 - (b) Illumination
 - (c) Temperature
 - (d) Energy sources
 - (e) Air and humidity
 - (f) Vibration
 - 3. Errors
 - (a) Omission
 - (b) Commission
 - 4. Not recognizing hazards
 - 5. Incorrect decisions
 - 6. Tasks done at wrong time
 - 7. Tasks not performed or incorrectly performed
 - B. Causes:
 - 1. Inadequate attention to human design criteria
 - 2. Poor location, layout of controls
 - 3. Equipment complexity
 - 4. Inherent hazards
 - 5. Incorrect installation
 - 6. Failure of warning devices
 - 7. Inadequacy of procedural safeguards
 - (a) Failure to follow instructions
 - (b) Lack of knowledge of procedures
 - 8. Inadequate training
 - 9. Improper or insufficient maintenance
 - C. Control Methods:
 - 1. Design (to address items 1 - 6)
 - 2. Safety devices (redundancy)
 - (a) Isolation (separation)
 - (b) Barriers (guards)
 - (c) Interlocks (deactivation)
 - (d) Temperature sensor (fuse)
 - 3. Warning devices - five senses (redundancy)
 - (a) Visual (sight) - color, shape, signs, light
 - (b) Auditory (hearing) – bell
 - (c) Tactile (touch) - shape, texture
 - (d) Gustatory (taste)
 - (e) Olfactory (smell)
 - 4. Procedures and training
 - (a) Clear warning labels (nature of hazard, action to avoid injury, consequences)
 - (b) Use of complete, proper, safe procedures
 - (c) Adequate training (also refresher training)
 - (d) Backout/recovery procedures
 - (e) Protective equipment
 - (f) Emergency procedures
 - (g) Proper maintenance procedures

[illegible]

Appendix O – Accidents by Time of Day



Appendix P – Passenger Accidents

